

*On the Fishes obtained by the Naturalist Expedition in Rio Grande do Sul.*

By *E. D. Cope.*

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The fishes of the Brazilian province of Rio Grande do Sul have been locally studied by Hensel (1868-70) and Von Jhring (1893), so that they are better known than those of some other parts of South America. The latest enumeration, that of Von Jhring, includes forty-nine species. The present report includes forty-one species, of which twenty are not found in Von Jhring's list. Perhaps three of these are enumerated by that author under different names, so that this paper adds perhaps seventeen species, bringing the whole number to sixty-six species. The number of species in Von Jhring's list which I have not found in this collection is thirty. This wide diversity in the collections is probably due to the fact that those studied by Hensel and Von Jhring were made much nearer the coast, while my collection was obtained in the interior near the mountains. The absence of various species of the lower and tide waters from my collection, together with the presence of species of the smaller streams, may be thus accounted for. A summary of the results will be given at the end of the paper.

The collection now reported on was made by Mr. H. H. Smith, who was sent to Brazil in the interest of the *American Naturalist*. A report on the Mammals was made in that periodical in the year 1889; and reports on the Reptiles and Batrachia have been published in the *Proceedings* of this Society for 1884 and 1887.

## PLECTOSPONDYLI.

### CHARACINIDÆ.

#### MACRODON TAREIRA Bl. and Schn.

Authors who think, with the American Ornithologists' Union, that scientific nomenclature may record error instead of truth, call this well-known South American species, *Macrodon malabaricus*, because Bloch described it first under that name, under the mistaken idea that it was a native of India.

#### XIPHORHAMPHUS BRACHYCEPHALUS sp. nov.

Teeth of the maxillary bone small, equal. Head short, body deep, scales large. Depth of body entering length without caudal fin, three times; length of head in the same four times. Scales  $\frac{10}{51}$ . Fin radii, D. 11; A. 27. Muzzle short, entering length of head  $\frac{3.5}{6}$  times; diameter of eye entering the same four times; interorbital space convex, its width entering length of head 3.5 times, hence equal length of muzzle. The profile is slightly descending and nearly straight. The

extremity of the maxillary bone is in line with the posterior border of the orbit. The pectoral fin reaches the base of the ventral, but the ventral does not quite reach the anal.

The color is silver, with greenish and bluish reflections. A large black spot at the base of the caudal, and a smaller one behind the epiclavicle. No lateral band.

Total length, 177 mm. ; length to base of caudal fin, 145 mm. ; length to base of anal, 89 mm. ; length to base of ventral, 63 mm. ; length of head, 37 mm.

This species is near the *X. hepsetus* Cuv. From the full description and figures given by Steindachner,\* we learn that in that species, both the body and head are of more slender proportions at all ages, and that the interorbital diameter is relatively narrower. It possesses also a silver lateral band which terminates in a black stripe on the caudal peduncle and fin. The scale and ray formulæ are the same in the two species.

The *X. jenynsii* Gthr. was thought by Steindachner to be identical with the *X. hepsetus*, but he subsequently concluded that it is distinct (see *Sitzber. Wien Akad.*, 1891, p. 371). It is evidently very near the latter, and has a more slender form of head and body than the *X. brachycephalus*. The depth enters the length, according to Steindachner, 3.3 to 3.5 times ; and the length of head enters the length 3.5 to 3.6 times. The interorbital width is less, entering the length of the head 4 to 4.5 times. Scales of lateral line 56-62.

Two specimens.

#### XIPHORHAMPHUS HEPSETUS Cuv. Steind., *l. c.*

Two specimens. The smaller measuring 179 mm., agrees with Steindachner's description, but the larger, 215 mm., differs in exceeding the proportions given as characteristic of old individuals. Thus the scale formula is  $\frac{17}{76}$  ; the highest figures given by Steindachner being  $\frac{14}{70}$ . The eye enters the total length of the head 5.5 times ; the highest relative proportions of Steindachner's description being 4.66 times. In both specimens the length of the head exceeds the depth of the body.

#### ASIPHONICHTHYS STENOPTERUS Cope, *Amer. Naturalist*, 1894, p. 67.

*Char. gen.*—Subfamily Hydrocyoninae. Teeth on premaxillary, maxillary and dentary bones ; the first in two series, the last in one ; those of both of unequal lengths. Dorsal fin short, above the anterior rays of the long anal. No lateral line of pores, except on a few anterior scales. Gill-rakers lanceolate.

This genus is *Anacyrtus* without a lateral line of pores.

*Char. specif.*—Dorsal outline elevated ; profile of cranium concave ; mouth directed obliquely upwards. Scales 42, 20. Fin radii, D. 11 ; A. 46, the anterior three shorter ; V. 9 ; P. 15. Depth of body 2.66 times in

\* *Sitzungsber. K. Wien Akad. Wiss.*, Nov., 1876, p. 35.

length without caudal fin. Length of head 3.8 times in the same. Eye three times in head; exceeding length of muzzle and equal interorbital width. Dorsal fin elevated, narrow; pectorals narrow, covering basal third of ventrals; ventrals lanciform, reaching fourth anal ray. Color silvery, with an ill-defined silver lateral band. An obscure postclavicular dark spot, and some obscure dark dots on the silver lateral band. No basal caudal spot.

Length to end of middle caudle radii, 80 mm.; length to base of caudal fin, 72 mm.; length to base of anal (oblique) 35 mm.; length to base of ventrals, 26 mm.; length of head, 20 mm.

A single specimen from the Jacuhy. Besides the generic characters, the scales are larger than in the known species of *Anacyrus*.

*CHORIMYCTERUS TENUIS* Cope, *Amer. Naturalist*, 1894, p. 67.

*Char. gen.*—Denticulate teeth on intermaxillary and dentary bones, and in a single row on the former. On the dentary bone a second interior series of simple teeth. Dorsal and anal fins short; the former commencing in front of the base of the latter. Nares separated by a wide space. Lateral line complete.

This genus is near to *Characidium*, but differs in having two series of mandibular teeth. From *Piabucina* it differs in the separated nostrils and the presence of a lateral line.

*Char. specif.*—Form slender; the depth contained seven times in the length less the caudal fin. Profile of muzzle decurved; mouth small, the end of the maxillary nearly reaching the anterior margin of the orbit. Eye large, oval, contained in the length of the head three times, and as wide as the interorbital space opposite its posterior border. Teeth of both jaws rather elongate, with a single lateral denticle on each side of and near the acute apex. Length of head five times in total length without caudal fin. Scale  $\frac{3}{39}$ . Fin radii, D. 11; A. 9; V. 9; P. 12. Pectorals elongate, not reaching ventrals; ventrals reaching about half-way to anal. Caudal fin deeply emarginate. Color silvery, most brightly on the suborbital and opercular regions. Scales with slightly shaded borders.

Total length, 66 mm.; length to base of caudal fin, 55 mm.; length to base of anal, 41 mm.; length to base of ventral, 27 mm.; length to base of dorsal, 22 mm.; length of head, 11 mm.

This fish is more slender than the *Characidium fasciatum* of Reinhardt, and has a different scale formula and coloration. It is still more slender than the *C. etheostoma* Cope, and *C. steindachnerii* Cope.

*PSEUDOCORYNOPOMA DORLÆ*. Perugia, *Ann. Mus. Genoa*, x, 1891, 646.  
*Bergia altipinnis* Steind., *Stzber. K. Akad. Wien*, 1891, 336.

*Char. gen.*—Dorsal fin originating above the anterior part of the elongate anal fin. Denticulate teeth on the premaxillary and dentary bones,

in two series on the former and one series on the latter; no canines. Nares close together. Pectoral and ventral regions compressed acute. Lateral line straight, continuous. Ventral fins small. Gill rakers lanceolate.

This genus is allied to *Gasteropelecus*, but the lateral line is of the normal type, that is, straight and continuous. From *Piabucina*, it differs in having two series of premaxillary teeth, and from *Chalcinus* in the absence of conical teeth between the dentary series. It is an interesting form connecting *Gasteropelecus* with *Chalcinus*.

*Char. specif.*—General form rhombic, the profile straight from the base of the dorsal fin to the extremity of the muzzle. Mouth opening obliquely upwards. Pectoroventral outline moderately and not extremely convex. Pectoral fin elongate, falcate, reaching anal; ventral not reaching anal.

Scales  $\frac{7}{40}$  Fin radii, D. 1.10; A. 37; V. 7; P. 13. Anterior rays of dorsal and anal fins in probably male individuals, produced, the former reaching the base of the caudal. The caudal deeply emarginate. Depth entering length 2.6 times; length of head entering same four times. Diameter of eye entering length of head (without chin) three times; and entering the interorbital width 1.25 times. General color silvery; a whiter silver band extending from near the epiclavicular region to the base of the caudal fin above the lateral line. No dark markings.

Total length, 67 mm.; length to base of caudal fin, 52 mm.; length to base of anal (oblique), 33 mm.; length to base of dorsal (oblique), 32 mm.; length to base of ventral, 25 mm.; length to base of pectoral, 15 mm.; length of head, 13.5 mm.

This is apparently an abundant species in the Jacuhy. My specimens agree with those described by Steindachner from Montevideo, except that in the latter the eye is a little smaller, entering the length of the head  $3\frac{1}{2}$  times, and there are 40–1 anal rays. The *P. argentinum* Holmb. from the Plata (*Revista Argentina*, 1891, p. 190) is, to judge from the description, a more slender fish, with the lateral line nearer the dorsal border.

**TETRAGONOPTERUS RUTILUS** Jenyns; Steindachner, *Sitzungsber. Wien Akad. Wiss.*, November, 1876, p. 17.

The five species of *Tetragonopterus* represented in the collection may be distinguished synoptically as follows:

a. No teeth on the maxillary bone.

Scales of lateral line, 40; anal rays, 28; eyes,  $\frac{1}{3}$  head, equal interorbital space; elongate ..... *T. rutilus*.

Scales of l.l., 36; anal rays, 28; eye,  $\frac{1}{4}$  head,  $1\frac{1}{2}$  interorbital space; orbicular ..... *T. jacuhiensis*.

Lateral line, 32.3; anal rays, 23; eye, 2.5, equal interorbital space; rhombic ..... *T. eigenmanniorum*.

Lateral line, 37; anal rays, 20; head thick; eye,  $3\frac{1}{2}$ ,  $1\frac{1}{2}$  in interorbital; elongate..... *T. laticeps*.

aa. Teeth on the base of the maxillary bone.

Lateral line, 35; anal rays, 19; eye large.  $2\frac{1}{2}$  in head, equal interorbital; elongate; no spots..... *T. pliodus*.

In the *T. rutilus* the form is rather elongate, the depth entering the length (minus caudal fin), 2.66 times, while the head is short, entering the length 4.5 times. The eye is large, entering the length of the head three times, and equaling the width of the convex interorbital space. The maxillary is toothless and reaches the vertical line of the anterior border of the orbit. The muzzle is as long as three-quarters the diameter of the eye. Scale formula,  $\frac{7}{40}$ . Radii, D. 11; A. 28;

V. 7, with a lanceolate scale at axilla. The pectoral reaches the base of the ventral, but the ventral does not reach the anal. Origin of dorsal a little posterior to that of ventral. The color is yellow silvery, whiter on the middle of the sides. Humeral and caudal spots obscure, the former not visible in some specimens; apparently vertical where obscurely visible. Median caudal rays black.

Total length, 135 mm.; length to base of caudal, 110 mm.; length to base of anal, 70 mm.; length to base of ventral (oblique), 50 mm.; length of head, 24 mm.

The specimens agree in the main with Steindachner's description,\* although the number of scales of the lateral line is a little greater than is given by him. In outline of body our specimens are most like his elongated variety (Pl. ii, Fig. 3); but the head is shorter, since in the variety the head enters the length four times instead of 4.5 times.

A few specimens.

#### TETRAGONOPTERUS JACUHIENSIS SP. NOV.

The deepest bodied species of the Jacuhy, rather deeper than the *T. maculatus* of Cuvier. The depth enters the length less the caudal fin 2.25 times, and the length of the head enters the same four times. The eye is rather small, entering the length of the head four times, while the interorbital space is 1.5 times its diameter. The profile of the head is slightly concave; and those of the back and belly are about equally convex.

Scales  $\frac{6-8}{36}$ . Radii, D. 11; A. 27-8; V. 8, with axillary scale. First dorsal ray a little posterior to first ventral ray. Color silvery with steel-blue reflections. Humeral and basal caudal spots conspicuous, the former subround and situated in the centre of a pale area, which is bounded posteriorly by a vertical curved black border, sometimes indistinct. Caudal spot continued on middle caudal rays.

Total length, 114 mm.; length to base of caudal fin, 95 mm.; length

\* *Sitzungsber. K. Wien Akad.*, November, 1876, p. 17.

to base of anal, 63 mm. ; length to base of ventral (oblique), on 45 mm. ; length of head, 23 mm.

This species is allied to the *T. maculatus* Linn., but that species has a larger eye (one-third head) and a longer anal fin (32-3 rays). \*

The number of rays is so constant in numerous specimens, that, if Steindachner's figures are correct, which there is no reason to doubt, this form must be distinct. The *T. maculatus* is ascribed by both Boulenger and Von Jhring to Rio Grande do Sul.

The proximal part of the maxillary bone is minutely serrate, but not dentate.

Fifteen specimens.

#### TETRAGONOPTERUS EIGENMANNIORUM sp. nov.

A species of rhombic form, differing from those above described in the smaller number of anal radii, and fewer scales of the lateral line. Depth entering length without caudal fin two and a half times ; length of head in the same 3.4 times. Eye large, longer than muzzle, entering head three times, and equal interorbital width. Scales  $\frac{7}{32}$ . Radii, D. 11 ; A. 23.

Ventral commencing a little anterior to first dorsal ray, not reaching anal. Pectoral reaching ventral. Profile of head very slightly concave. Dorsal and ventral profiles subsequently arched. Color silvery, with a whiter silvery lateral band. No humeral nor distinct caudal spot. Middle caudal rays dusky.

Total length, 67 mm. ; length to base of caudal fin, 53 mm. ; length to base of anal, 35 mm. ; length to base of ventral (oblique), 26 mm. ; length of head, 15 mm.

But one specimen presents exactly the typical characters of this species, but five others probably belong to it. They have a few more scales of the lateral line, as 33-4, and one has 36. They have a basal caudal spot, and four of them show traces of the humeral spot, and have a steel-blue reflection, as in the *T. jacuhiensis*. The small number of the anal rays, 23-4, distinguishes it from the latter, where there are always 27-8 ; and the form is more elongate.

This species is dedicated to Prof. and Mrs. C. H. Eigenmann of the University of Indiana, whose work on the fishes of South America has so elucidated the subject.

#### TETRAGONOPTERUS LATICEPS sp. nov.

Form, elongate oval ; depth entering length (without caudal fin) 2.6 times ; length of head into same, 3.75-4 times. Profile of back descending regularly from dorsal fin ; of front, straight or slightly concave. Diameter of eye greater than length of muzzle, entering 3 to 3.3 times in length of head. Front slightly convex transversely, wider than diame-

\* Teste Steindachner, *l. c.*, p. 10.

ter of eye, and entering length of head 2.33 to 2.5 times. Scales,  $\frac{6}{37}$ ; Raddii, D. 11; A. 20. Pectoral fin reaching base of ventral; ventral not reaching anal. No denticulations on maxillary bone. Color, silvery; a silver lateral stripe, with humeral and caudal spots. The humeral spot is subround and the caudal extends to the end of the median caudal rays.

Total length, 74 mm.; length to base of caudal fin, 60 mm.; length to first anal ray, 40 mm.; length to base of ventral (oblique), 28 mm.; length of head, 16 mm.

Eighteen specimens of this species are before me. It is allied to the *T. fasciatus* Cuv., *T. brevimanus* Gunther, and *T. jenynsii* Steindachner. The body is deeper than in the first named, and the frontal region is wider; the muzzle is shorter and the maxillary bone is not denticulate. From *T. brevimanus* it differs in the deeper body, larger eye, and longer pectoral fin. The *T. jenynsii* has a narrower front, only 33 scales of the lateral line, and the humeral spot a vertical bar. According to Steindachner's figure, the dorsal outline descends towards the dorsal fin; in *T. laticeps* it rises to that fin. I would have suspected that this species might be the *T. ihringii* of Boulenger, but one of the principal characters of that species, as well as of the *T. alburnus* of Hensel, is that it has but 10 dorsal radii. The *T. obscurus* Hens. has the interorbital diameter equal the eye, and a vertical humeral spot.

#### TETRAGONOPTERUS PLIODUS sp. nov.

Form rather elongate, depth entering length (less caudal fin) three times; length of head entering the same four times. Maxillary bone extending beyond anterior border of orbit, supporting several tridenticulate teeth on its proximal portion. Eye large, much exceeding muzzle, entering length of head 2.25 times, and a little exceeding the interorbital width. Scales,  $\frac{4}{35}$ . Radii, D. 10; A. 19; V. 9. Pectorals not reaching ventrals, nor ventrals the anal fin. Dorsal originating a little posterior to line of origin of ventrals. Silvery, with a broad, distinct, silver lateral band. No spots of any kind.

Total length, 70 mm.; length to base of caudal fin, 57 mm.; length to base of anal, 38 mm.; length to base of ventral (oblique), 26 mm.; length of head, 13 mm.

This is apparently a rare species, only two individuals being contained in the collection. It has many peculiarities, one of which is the possession of only ten rays in the dorsal fin. It shares this character with the *T. alburnus* of Hensel from the same region, but this species has 27 rays in the anal fin and the body is more elongate. It has some points in common with the *T. ihringii* (Boulenger, *Amer. Magaz. Nat. Hist.*, 1891, p. 172). Boulenger does not mention the maxillary teeth, which he could scarcely have overlooked. It has also one or two additional rows

of scales above the lateral line, and has the humeral and caudal spots, which are wanting in the *T. pliodus*.

HEMIGRAMMUS LUETKENII Boul. *Tetragonopterus luetkenii* Boulenger, *Ann. Mag. Nat. Hist.*, 1891, p. 173. *Chirodon luetkenii* von Ihring, *Süsswass. Fische v. Rio Grande do Sul*, 1893, p. 22.

Form deep ovate, outlines of body equally convex. Profile of front straight, a slight concavity above line of preopercle. Depth of body into length (less caudal fin), two and a half times; length of head into the same, four times. Eye large, its diameter greater than length of muzzle, a little less than interorbital width, and entering length of head 2.8 times.

Scales,  $\frac{5-5\frac{1}{2}}{32}$ . Radii, D. 11; A. 23. Pectorals not reaching ventrals, and

ventrals not reaching anal. No teeth on the maxillary bone. Tubes of lateral line on eight to twelve scales. Dorsal fin originating a little behind vertical line of origin of ventrals. Color, silvery; a silver band on side. Humeral spot large, distinct, subround; caudal spot distinct, extending to extremities of median caudal radii.

Total length, 76 mm.; length, without caudal fin, 60 mm.; length to origin of anal, 49 mm.; length to origin of ventral (oblique), 29 mm.; length of head, 10 mm.

This species differs from the *H. robustulus* Cope in its more compressed head and in the absence of teeth on the maxillary bone. An abundant species in the Jacuhy.

#### CHIRODON MONODON sp. nov.

A single crenate tooth on the proximal extremity of the maxillary bone. General form rhombic oval. Depth in length, less caudal fin, 2.6 times; length of head in the same, 3.6 times. Eye large, its diameter exceeding length of muzzle, equaling interorbital width, and entering length of head

3 times. Scales,  $\frac{5}{32}$ . Radii, D. 10; A. 19-22. Pectoral reaching ven-

tral, and ventral nearly reaching anal. Origin of dorsal a little posterior to that of ventral. Lateral line extending on 9-10 scales. Silvery; an indistinct, narrow, dusky line visible on the middle of the side from the caudal fin to below the dorsal.

Total length, 46 mm.; length to base of caudal fin, 35 mm.; length to base of anal, 23 mm.; length to base of ventral, 15 mm.; length of head, 9 mm.

This small species has a scale formula about as in the *Hemigrammus iheringii*, but there is but one series of premaxillary teeth; there is a tooth on the base of the maxillary bone, and there are only ten dorsal rays. The number of anal rays is somewhat variable. Of the three specimens, one has 19 rays, the second 20, and the third 22. This is a deeper bodied form than the *C. pisciculus* Gird., and the only other spe-



cies, *C. interruptus* Jen., is said to have 11 dorsal rays and no maxillary teeth.

DIAPOMA SPECULIFERUM, *Amer. Naturalist*, 1894, p. 67.

*Char. gen.*—Adipose fin present. Dentition as in *Tetragonopterus*, *i. e.*, with two rows of denticulate teeth on the premaxillary bone and one row on the dentaries. Origin of the short dorsal fin entirely posterior to that of the ventrals. Anal fin elongate. Belly not keeled. The operculum produced posteriorly below the lateral line to an apex. Lateral line not complete. Nares close together. Inferior limb of external branchial arch without rakers.

This genus is allied to *Hemigrammus*, but has a peculiarly formed operculum, which displays a tendency towards the character which is so much developed in *Corynopoma* Gill.\*

*Char. specif.*—Form rather elongate, the depth entering the length 3.25 times (less caudal fin). Length of head entering the same 3.6 times. Maxillary bone elongate, reaching the line of the anterior border of the pupil, supporting 4-5 teeth at its proximal end. Eye large, its diameter exceeding the length of the muzzle, equaling interorbital width, and entering length of head three times, one diameter equaling the long horizontal diameter of the operculum and suboperculum. The latter two elements form a subtriangular plate, of which the long diameter is horizontal, and of which the base is continued as a process along the posterior border of the preoperculum. The apex of the triangle is formed by the extremity of the suboperculum, and is obtuse. Scales,  $\frac{4}{37}$ ; lateral line

pores and tubes present on ten scales behind the epiclavicle, and on eight scales anterior to the caudal fin. Radii, D. 1.9; A. 2.29; V. 7; P. 11. Pectorals just reaching ventrals, and ventrals not reaching anal. Caudal deeply emarginate, a curved patch of scales extending on the inferior lobe from the base. Anal fin with its free border concave, the anterior rays longer than the posterior, and the posterior longer than the middle rays.

Sides, excepting the dorsal portion and that part adjacent to the anal fin, with a mercury-like metallic surface; the operculum most brilliantly refugent, the checks little less so. A straight leaden line from the head to the base of the caudal fin. No spots.

Total length, 45 mm.; length to base of caudal fin, 36 mm.; length to base of anal, 22 mm.; length to base of ventrals, 17 mm.; length of head, 10 mm.; length of head to preoperculum, 6 mm.

But one specimen of this curious little fish was sent by Mr. Smith. It is the most brilliant of the *Characini*dæ known to me.

\* This genus received several names from Prof. Gill at the same time. Of these, Dr. Günther selected *Corynopoma*, as he had a right to do, and he has been followed in this by most other ichthyologists. One of the other names cannot therefore be now selected for this genus because it was printed on a previous page, as has been recently proposed.

## CURIMATUS GILBERTII Q. and G.

Numerous specimens.

## STERNOPYGIDÆ.

## CARAPUS FASCIATUS Pallas.

## STERNOPYGUS VIRESCENS Val.

Apparently abundant.

## NEMATOGNATHI.

## SILURIDÆ.

## RHAMDIA SAPO Val.

Five specimens which agree with the description given by the Eigenmanns, except in the possession of narrower bands of premaxillary and dentary teeth. The premaxillary patch is five times as long as wide.

## RHAMDELLA STRAMINEA sp. nov.

Surface of posterior cranial bones fossate, but covered with a thin skin. Fontanel reaching base of supraoccipital process, with a narrow bridge opposite the posterior border of the orbit. Adipose fin entering the length (to base of caudal) five times, and equal to depth of body; length of head entering total, four times. Upper lip projecting a little beyond lower; tooth band in both jaws wide; teeth well developed. Eye 4 times in length of head to angle of operculum; one and a third times in inter-orbital width, and one and a half times in length of muzzle. Centre of pupil nearer end of muzzle than opercular angle. Maxillary barbels reaching middle of ventral fins; external mentals reaching base of pectoral fins; middle mentals half as long as externals. Dorsal spine rather slender, elongate, toothless; pectoral spine more robust, longer than soft rays, with eight robust spines on its internal border, and more numerous smaller dentations on the anterior border, which are not recurved. Radii, D. I 6; A. 13; P I. 8. Caudal fin deeply emarginate, the superior lobe a little longer than the inferior.

Total length, 85 mm.; length to base of caudal fin, 68 mm.; length to base of anal, 50 mm.; length to base of ventral, 33 mm.; length to base of pectoral, 19 mm. Length of head to apex of supraoccipital process, 21 mm.

Color in spirits, brownish straw-color, with silvery opercle, rather sparsely dusted with black specks. Adipose fin dusky bordered.

Five specimens of this species, which approaches the *R. jenynsii* Gthr., according to the detailed description given by the Eigenmanns. That species is said to have the eye only one-fifth the length of the head, and the adipose fin is one-fourth the total length. The occipital process is said to be covered with a thick skin. In the *R. straminea* this process is rugose and is covered by a very thin skin, and approaches quite near to the dorsal plate. From the *R. eriarcha* E. and E., from the Uruguay

river, this species differs in the proportions of the eye and head, the much longer barbels, much shorter adipose fin, etc.

PIMELODUS NIGRIBARBIS Blgr., *Proceeds. Zoöl. Soc.*, London, 1891, p. 232, Pl. xxv, Fig. 1.

Several specimens.

LORICARIA CADEÆ Hensel, *Archiv. f. Naturgesch.*, 1868, p. 369.

Represented by four specimens of rather small size. The muzzle is depressed and is acuminate when viewed from above, and its length from the orbit enters the length of the head to the posterior extremity of the occipital plate two and a half times. The edges of the muzzle are hispid but not bristly. The abdomen is covered with a continuous series of scales, of which the lateral are elongate and directed forward, and the median smaller and in two rows. Those between the ventrals are distinct but solidly united, and there is a single anal which is notched in front for the anus. The scuta of the nape are furnished with obtuse keels, one on each side, which form a pair of ridges which converge forwards and are continued on the occipital plate until they approach quite closely. They then diverge and terminate above the postorbital plate. The third median nuchal plate is not ridged, but a lateral plate which joins it and the second nuchal on each side has a keel. There is no keel posterior to this, nor any between it and the superior keel of the lateral line. The space between the nostrils forms a median narrow ridge which bifurcates posteriorly, each half disappearing above the middle of the supraorbital border, from which it is separated by a groove, which is a posterior continuation from the nareal fossa. The central premaxillary ridge is divided by a narrow median groove, and a shallow groove bounds the lateral plates on each side, terminating in a preorbital fossa. Scales of lateral line, 28-29; the lateral keels uniting on the eighteenth scale. Diameter of eye, without the shallow notch, entering length of head 5.5 times and interorbital width 1.25 times.

The length of the head to the end of the occipital plate enters the length (less the caudal fin), 5.25 times; and the width of the head enters its length 1.4 times; the depth of the head enters the length of the same twice. Premaxillary jaws not separated by an emargination, but firmly united. Teeth,  $\frac{7}{7}$ . Lips coarsely and shortly fringed all round, the posterior coarsely tubercular and not notched posteriorly. Beard shorter than diameter of eye. The dorsal spine enters the total length (less caudal fin) 4.25 times, and the anal spine enters the same 5.6 times. Radii, D. I. 7; P. I. 6; V. I. 5; A. I. 5. The pectoral fins just reach the ventrals, and the ventrals the anal. The marginal rays of the caudal are not stronger than those of the other fins. Its border is concave, and the superior apex is a little longer than the inferior, and it is without filamentous prolongation.

Color light brown above, yellowish below. Five brown cross-bands on

the dorsal region and one on the nape. Five obscure dusky spots on the lateral border of the head to the opercular fissure. Dorsal fin with a dark spot near the extremity. Caudal with a dark spot at each apex and two at the base. Anal, ventrals and pectorals dusky at the extremity.

Total length, 78 mm. ; length to base of caudal fin, 66 mm. ; length to base of anal fin, 31 mm. ; length to base of ventral, 21 mm. ; length to base of pectoral, 11 mm. ; length to end of occipital plate, 15 mm.

The only species which it is necessary to compare with this one is the *Loricaria konopickyi* of Steindachner.\* According to this author this species resembles the *L. cadeæ* in most essential respects. It has, however, two lines of keels between the dorsal spine and the lateral ridge, where none exist in the *L. cadeæ*, and the middle rows of abdominal scales are in five rows instead of three. The teeth are nine or ten instead of six or seven, and the keels of the lateral scales come together on the fifteenth instead of the eighteenth row. The muzzle enters the head length 2.5 times instead of twice. The *L. konopickyi* is from the Amazon basin.

*Loricaria lima* Kner, to which this species is referred as identical by Von Jhring, differs as follows: The head enters the length 4.66 times; the superior ray of the caudal fin is produced; the eye enters the head 7.5 times; the fins are spotted.

LORICARIA SPFXII Steindachner, *Denkschr. Wien Akad. Wiss.*, 1831, 18 ; Pl. ii. Several specimens.

#### HISONOTUS LÆVIOR sp. nov.

Form rather slender, the depth at the base of the first dorsal ray entering the length to base of tail, six times; and equaling the length of the muzzle anterior to the orbit. Eye small, entering length of head five times, and three and a half times in the nearly flat interorbital space. Venter not entirely covered with scales, there being a series on each side, and a row of smaller ones in the middle, separated from them by a naked space. Median series expanding into a shield just posterior to bases of ventral fins. Dorsal and ventral aspects of caudal region rounded. Scales posteriorly moderately hispid, smoother anteriorly; on the top of the head the prickles very small. Lower lip convex, with narrow margin, and coarsely tubercular surface.

Origin of dorsal fin a little posterior to line of origin of ventrals. Caudal fin with the inferior angle produced a little farther than the superior. Spines of fins only moderately hispid, except towards the extremities of the pectorals, where the prickles are coarser. Radii, D. I. 7; P. I. 7; V. I. 5; A. I. 5. Scales of lateral line, twenty-eight. The pectoral fins reach the middle of the length of the ventrals, but the latter do not reach the anal.

\* *Denkschriften math. Wiss. Klass. Kais. Akademie d. Wissensch.*, 1879, p. 45, Pl. vi, Fig. 3, and Pl. vii, Fig. 1.

Color, light brown. The dorsal fin is sparsely and the caudal fin is closely spotted with blackish, and the spinous rays of both are light colored with dusky spots.

Total length, 53 mm. ; length to basis of caudal fin, 41 mm. ; length to base of anal, 25 mm. ; length to base of ventrals, 16 mm. ; length to line connecting bases of pectorals, 10 mm.

A single specimen from the Rio Jacuhy, Rio Grande do Sul.

This is the third species of the genus now known, the one first described being the *H. notatus* of Eigenmann.\* This species is said to be characterized by the presence of a triangular posterior process of the occipital element, and by the compressed and elevated form of the head ; characters not seen in the present species. The orbit is smaller, but the interorbital space is only as wide as three of its diameters. It has only twenty-five plates of the lateral line. The *Hisonotus nigricauda* † of Boulenger differs in the twenty-five plates of the lateral line, the I. 5 pectoral rays, the more numerous rows of ventral plates and the larger eye.

#### HISONOTUS LEPTOCHILUS sp. nov.

Form rather slender ; head rather depressed. Depth at first dorsal ray entering length to base of caudal fin, 5.5 times. Eye small, entering length of head 5.5 times, and three times on the rather flat interorbital space. Venter covered with from ten to twelve rows of scuta, a single row on each side anteriorly, larger than the others. Caudal region rounded above and below. Hispid everywhere, especially on the super-temporal region. Three transverse and a median rhombic scuta between the occipal scute and the base of the dorsal spine. Lower lip thin, with thin transverse posterior margin and inconspicuous tubercles.

Dorsal fin originating a little posterior to ventrals. Pectorals reaching middle of ventrals ; ventrals barely reaching anal. Inferior angle of caudal fin a little longer than the superior. Radii, D. I. 7 ; P. I. 6 ; V. I. 5 ; A. I. 5. Scales of lateral line, 23.

General color dusky, with numerous small pale spots everywhere, most conspicuous when the fish is immersed in fluid. Fins lighter, conspicuously spotted with dusky.

Total length, 54 mm. ; length to base of caudal fin, 41 mm. ; length to base of anal, 35.5 mm. ; length to base of ventrals, 17.5 mm. ; length to base of pectorals, 10 mm. ; interorbital width, 6 mm.

The important characters which distinguish this species from the *H. laevis*, are the thin and truncate lower lip with feeble tuberculation ; the numerous ventral plates ; the narrower interorbital space, and the greater hispidity, especially of the head. It differs from the *H. notatus* in much the same way as the *H. laevis*.

\* "Revision of South American Nematognathi," *California Acad. Sciences*, 1890, p. 391.

† *Proceeds. Zoöl. Soc.*, London, 1891, p. 231.

HISONOTUS NIGRICAUDA Boulenger. *Otocinclus nigricauda*, Boul., *Proceeds. Zool. Soc.*, London, 1801, p. 234; Pl. xxv, Fig. 3.

One specimen. This species differs from those described above, in the presence of only two nuchal scuta between the occipital bone and the base of the first dorsal ray, as represented in Boulenger's figure. In this point it agrees with the two species of *Otocinclus* to be described below. In the two species of *Hisonotus* referred to, there are four nuchal plates crossing the same space.

The specimen of *H. nigricauda* measures, only 30 mm. The sides and posterior two-thirds of the middle line of the belly are squamous, the remainder smooth.

OTOCINCLUS FLEXILIS sp. nov.

Head large, muzzle rather short, width posteriorly equal depth of body at first dorsal spine, and entering the length less the caudal fin four and a quarter times. Eye entering length of head four times, and interorbital width three times. Body compressed; superior and inferior aspects of caudal peduncle flattened, and separated from sides by an angular keel. Surfaces everywhere hispid. Perforations of supratemporal plate numerous. Lower lip very thin, and entirely smooth. Plates of belly in two lateral rows which are directed forwards, and are separated by a single row on the middle line, which is sometimes more or less incomplete, thus permitting those of the lateral series to come in contact. Occipital plate angulate posteriorly, and separated from dorsal spine by two transverse plates and a small median posteriorly.

The pectoral spines reach the base of the ventral fins, and the ventrals fall considerably short of the anal. Caudal lobes acute, subequal. Radii, D. I. 7; P. I. 6; V. I. 5; A. I. 5. The spines are all strongly hispid, and those of the pectoral fin are more robust than that of the dorsal. Plates of lateral line, 25.

Light yellowish brown, with a row of about six oblong dusky spots along the lateral line, which become obscure anteriorly. A series of corresponding spots along the dorsal region. Dorsal and caudal fins light colored with numerous dusky spots. A black spot at the base of the caudal fin in some specimens.

Total length, 56 mm.; length to base of caudal fin, 43 mm.; length to base of anal, 27 mm.; length to base of ventral, 19 mm.; length to base of pectoral, 10 mm.; length of head, 10 mm.; interorbital width, 7.5 mm.

This species need only be compared with the *O. affinis* of Steindachner, which is found near to Rio de Janeiro. That species has a posterior tuberosity of the occipital plate which is wanting in this species, and Steindachner represents only one entire plate between the occipital and the base of the dorsal spine. This region is more depressed in the *O. flexilis*, and the body is considerably more compressed, from the dorsal to

the caudal fins. The eye is also smaller than in the *O. affinis*. The lip is even weaker than in the *Hisonotus leptochilus*.

Rio Jacuhy, Rio Grande do Sul; numerous specimens.

#### OTOCINCLUS FIMBRIATUS sp. nov.

Form moderately stout; depth at base of D. I. entering length without caudal fin, four times. Head rather depressed with the muzzle rounded, entering the length (measured to opercular border) three and a half times. Eye entering length of head 4.25 times, and the flat interorbital space 2.75 times. Posterior lip well developed, coarsely tubercular, its border, together with the border of the anterior lip and the inner edge of the beard, fringed with obtuse processes. Occipital plate with acute apex, separated from base of dorsal spine by two transverse plates and a small median posterior one. Venter with three series of scuta; a lateral series of long ones directed forwards on each side, and a row of median scuta in contact with them. Scales everywhere hispid. Supratemporal perforations small, numerous, but concealed by the integument. Inferior and superior aspects of caudal region flattened, and separated by an angular keel from the sides.

Origin of dorsal fin immediately above that of the ventral. Caudal lobes acute, equal. Radii, D. I. 7; P. I. 6; V. I. 5; A. I. 5. Pectorals reaching a little beyond base of ventrals; latter barely reaching base of anal. Twenty-five rows of scuta in lateral line.

Color, light reddish yellow. There are four large dusky spots along the lateral line, the anterior enlarged and obscure. A series of corresponding dorsal spots. Caudal fin with three vertical dusky bars, which are sometimes broken into spots. Other fins with a dusky spot at base; the anal and dorsal with the spinous ray entirely dusky. Below, straw color.

Total length, 38.5 mm.; length to base of caudal fin, 28 mm.; length to base of anal, 18.5 mm.; length to base of ventral, 13 mm.; length to base of pectoral, 7.5 mm.; interorbital width, 5.5 mm.

This is the smallest of the Siluridæ here described, and is to be compared with the *Otocinclus affinis* already mentioned. The angulation and elevation of the nuchal region described by Steindachner as characteristic of that species are here wanting, and the fringe of the lips is not figured nor described by him. The eye is considerably smaller, entering the length of the head to the apex of the occipital shield 5.5 times instead of four times. In the *O. affinis* there is a longitudinal lateral band instead of spots, and the fins are not represented as spotted, as is the case with the *O. fimbriatus*. As compared with the *O. flexilis*, the *O. fimbriatus* differs greatly in the tubercular and fringed lip, relating to it in this respect much as the *Hisonotus levior* does to the *H. leptochilus*. It is a smaller species than the *O. flexilis*, and is more brightly colored and with less numerous lateral spots. The ventral fins are relatively longer, and the

dorsal fin originates above their base, and not behind it, as is the case in *O. flexilis*.

Rio Jacuhy, Rio Grande do Sul ; numerous specimens.

In the many specimens of this species and the *O. flexilis* in the collection, the adipose fin spine is constantly wanting.

#### PLECOSTOMUS COMMERSONII Val.

One adult specimen. A young individual, which I suppose to belong to this species, exhibits the following characters :

Scuta not connected with each other anterior to the posterior border of the dorsal fin, and consisting of a median ossification only, each scute supporting a median comb of bristle-like teeth, which is longitudinal on most of them and is directed obliquely upwards posteriorly on the superolateral series. Besides the central comb, each scute has a shorter one near its superior and inferior extremities. Inferior surface, as far as the vent, without granules or scales. Scuta of lateral line, 28. Traces of a longitudinal angle on the posterior part of the supratemporal plate, and of two near together on the posterior part of the occipital. Head marked with coarse granular ridges, which are little marked on the suborbital and interorbital regions, and are replaced by fine lines on the anterior part of the occipital plate. Muzzle acuminate oval, viewed from above ; tip naked ; sides without bristles. Occipital bounded posteriorly by a single nuchal plate, which is separated from the basal dorsal fin plate by a second nuchal. Lip large, entire, coarsely tubercular. Teeth about  $\frac{1}{2}$  on each side. The humeral angle extends on two plates only.

Fin radii, D. I. 7 ; P. I. 6 ; V. I. 5 ; A. 5. The eye enters the length of the head to the apex of the occipital plate six times, three times in the muzzle, and 2.25 times in the interorbital space, which is plane. The base of the dorsal fin is as long as the space from its posterior ray to half way between the adipose fin and the base of the caudal. The pectoral extends a little beyond the base of the ventral, and the ventral to a short distance beyond the posterior ray of the anal fin. The inferior apex of the caudal fin is considerably longer than the superior.

Total length, 47 mm. ; length to base of caudal fin, 34 mm. ; length to base of anal fin, 23 mm. ; length to ventral, 17 mm. ; length to base of pectoral, 9 mm. ; length of head to apex of occipital plate, 13 mm. Color in alcohol, reddish brown, an obscure dark shade about the base of the dorsal fin. A single row of dusky spots in each membranous space of the dorsal fin. Caudal fin with about three oblique vertical cross-rows of rufous spots.

The single specimen on which this description is founded is probably young, yet various indications point to its being of small size at maturity. The well-developed lip and tubercles are those of a mature fish, and the relatively small size of the eye indicate that little change is to be looked for in the proportions of the head. It is probable that the deficient ossification of the anterior body plates is a character of immaturity.



## PLECOSTOMUS ASPIOGASTER sp. nov.

Head with three obtuse angles; the lateral extending posterior to the orbits; the median obscure between the orbits, but distinct on the occipital plate. Belly covered with granular scales which are collected into indistinct scuta posterior to the lip. Posthumeral ridge short, covering only four or five scuta. Besides this, the scuta are not keeled, but are distinctly angular on the dorsolateral and ventrolateral rows, and traces of keels exist on the anterior scuta of the two median lateral rows. Occipital plate bounded posteriorly by two scuta which are obtusely angulated, and these are separated from the base of the dorsal spine by three transverse nuchal plates, each of which has an obtuse lateral angle of the surface. There is a naked patch on the end of the muzzle, which does not reach the superior surface. Eye small, entering length of head eight times, muzzle five times, and interorbital space 3.75 times. Lateral line of scuta, 30. All the scuta are rough with longitudinal ridges, but they are not very spinous. Inferior and superior surfaces of caudal peduncle flattened. Length of head entering total (without caudal fin), three and one-third times.

Base of dorsal fin equal space between its posterior ray and a point half way between adipose and caudal fins. First dorsal ray equal length of head; shortest caudal rays equal from end of muzzle to posterior border of orbit. Radii, D. I. 8 in three specimens, I. 9 in one; P. I. 6; V. I. 5; A. 5. Pectoral extending to basal third of ventral; ventral to posterior border of anal. Teeth  $\frac{4}{2}$  on each side the terminal portion elongate, amber-colored. Length of median caudal rays .66 of length of head.

Total length, 250 mm.; length to base of caudal fin, 198 mm.; to base of anal, 122 mm.; to base of ventral, 82 mm.; to base of pectoral, 41 mm. Length of head to posterior border of occipital plate, 54 mm.; width of head at opercular fissure of lateral angle, 49 mm. Length of specimen with dorsal radii I. 9, 275 mm.

Color above, dark brown, spotted anteriorly with dusky; below unspotted light brown. There are two or three dusky spots on each scuta, but these are not visible posterior to the dorsal fin. The head is closely spotted with very small dusky spots, which are large and more distinct on the supratemporal region, where they have a diameter of about a millimeter and are separated by spaces of about the same diameters. The dorsal fin is coarsely spotted with dusky, there being one or two rows on each interspinous membrane. The pectorals, ventrals and anal are similarly spotted, with a single row between the spines, and the caudal fin is unspotted.

In general proportions, and in the fin and scale formula, this species resembles the *P. commersonii*, but in various other respects it apparently resembles the *P. carinatus* of Steindachner. It differs from this species in the very obscure or absent carination, in the much smaller eye, and in the shorter base of the dorsal fin, according to its describer. It is from

the Jutahy in Western Amazonia. The four specimens of the *P. aspilogaster* before me are from the Jacuhy, Rio Grande do Sul. This species also approximates the *P. limosus* Eigenm. (*Proceeds. Calif. Acad. Sci.*, 1888, pp. 167-8), from the Uruguay R. According to the description this species has the occipital plate bordered by a single nuchal instead of by three, and the middle rays of the caudal fin are nearly equal to the length of the head. The postdorsal region should be rounded above and below, whereas it is flattened, and the fins and belly are spotted. In the *P. aspilogaster* the caudal fin and belly are without markings.

The *Plecostomus virescens* Cope (*Proceeds. Academy, Philadelphia*, 1874, p. 137) was founded on young individuals from Eastern Peru. The Eigenmanns state their inability to locate it in their system of Nematognathi. In their table of the genus *Plecostomus* (*l. c.* p. 398) is a section which includes species with the ventral integument more or less scaleless, a character which Boulenger alleges to be more or less untrustworthy. In any case two specimens of the *P. virescens* of 60 mm. in length have the belly smooth. In one of 70 mm. a few granules appear on the median line of the belly. In one of 92 mm., a band of granules extends from the anus to the coracoid bridge on the middle line spreading and fading out laterally on the belly. Supposing the latter character to be retained to maturity (which is uncertain) the *P. virescens* differs from the species referred to the section with naked bellies by the Eigenmanns. Disregarding the squamation of the belly, the former enters the section which includes the *P. bicirrhosus*. The l.l. is 26-7. Superciliary borders a little raised. The triangular part of the occipital bone is bordered by two scuta on each side, and one scutum which touches the apex, and none of them are angulated. Body scales not keeled. The base of the dorsal equals its length from the adipose fin. A few small spines at the inferior opercular angle. Head and body unspotted. All the fins spotted. Apparently nearest the *P. villarsii* Luetken.

#### CALlichthys TAMOATA Linn.

CORYDORAS PALEATUS Jenyns. *C. marmoratus* Steind., *Denkschr. K. Akad. Wien*, 1879 (see Pl. v, Fig. 1); good figure.

About sixty specimens, varying in length from 35 mm. to 70 mm. I have examined about fifty of these in order to ascertain whether there is any variation in the degree of extension of the coracoid bones over the pectoral region. There is no variation, that of each side remaining widely separated from the corresponding one of the other side in all the specimens. Not having met with any variation in any of the species in this respect, I distinguished the species where the pectoral region is enclosed below by the coracoids, as a distinct genus, retaining for it the name *Corydoras*, and naming the series with naked breast, *Gastrodermus*.\* According to Eigenmann,† the type of *Corydoras*, *C. punctatus* L., possesses

\* *Proceeds. Amer. Philos. Soc.*, 1878, p. 681.

† *Revision of S. Amer. Nematognathi*, 1890, p. 465.

the character which I have assigned to Gastrodermus, which is therefore the true Corydoras. It therefore becomes necessary to give the genus with armored thorax a new generic name. This I propose shall be Osteogaster. The type is the *Corydoras equeus* of Steindachner, and the only other species which can be positively assigned to it is, according to Eigenmann, the *C. splendens* Castelnau.

### ICHTHYOCEPHALI.

Prof. Gill has called my attention to an error which occurs in my paper on the classification of fishes published in 1871, in the exchanged places of the genera Monopterus and Symbranchus. The characters of the one are by an inadvertence ascribed to the other, by an accidental exchange of the names.

#### SYMBRANCHIDÆ.

SYMBRANCHUS MARMORATUS Bloch.

#### HAPLOMI.

#### CYPRINODONTIDÆ.

GIRARDINUS CAUDIMACULATUS Hensel., *Arch. f. Naturgesch.*, 1870, p. 362 ;  
Von Jhring. *Süßwasserrf. v. Rio Grande do Sul*, 1893, p. 28.

Depth of body a little greater than length of head. Dorsal fin originating above middle of anal. Scales 28-8. Raddi, D. I. 7 ; A. 10. Eye one-third head, exceeding length of muzzle, and 1.5 times in interorbital width. Scales between interorbital space and dorsal fin, 18. Yellowish with a black vertical spot on the thirteenth scale from the caudal fin.

### PERCOMORPHI.

#### CICHLIDÆ.

CRENICICHLA LEPIDOTA Heckel ; Steindachner, *Sitzber. K. Wien Akad. Wiss.*, 1874, p. 22.

Numerous specimens ; evidently the common perch of the Jacuhy.

CRENICICHLA LACUSTRIS Cast. ; Steindachner, *Sitzber. K. Wien Akad. Wiss.*, Dec., 1874, p. 18.

Form elongate, body compressed ; profile gently decurved from the first dorsal ray to the upper lip, which is less produced than the prominent mandible. The length of the head is contained in the total 3.66 times, and into that of the head and body three times. Depth of body contained in total 5.5 times, and into that of head and body 4.5 times. Eye not large, entering length of head 6.5 times ; twice in muzzle without chin, and 1.6 times in interorbital space, which is slightly convex transversely. Scales  $\frac{7-9}{22}$  ; those of the lateral line fewer than those of the transverse rows, for the reason that on the anterior part of the body one lateral line scale is bounded by three scales of the transverse rows, and

on the posterior part of the body, one lateral line scale corresponds to two transverse rows. Thus the transverse rows number 72, while there are only 40 in the lateral line. Fin radii, D. XX. 12; A. III. 9; V. I. 5; P. 17. Color brownish above and yellowish below in alcohol. Sides of body and head with dorsal and anal fin rather sparsely spotted with small black spots. A much larger black spot at the base of the caudal fin, which is not light bordered. A black band from the eye, the opercular border, and another very distinct one from the eye downwards across the cheek. Paired fins uniformly yellowish.

Total length, 196 mm.; length to base of caudal fin, 168 mm.; length to base of anal, 115 mm.; length to base of ventral, 89 mm.; length to base of dorsal (axial), 53 mm.

The number of transverse rows of scales is intermediate in the genus, while the number of those traversed by the lateral line is smaller than is mentioned by authors as occurring in any known species. The prominence of the lower jaw approximates a character of the *C. lucius* Cope, of the upper Amazon, but in that species the top of the head is flat and horizontal and not convex and decurved. The scales are also larger.

But three specimens of this fish were taken by Mr. Smith. The smallest measures 137 mm. in total length and differs as a younger individual in the larger eye, which enters the head 4.75 times, and equals the inter-orbital width. Radii, D. XXII. 13; A. III. 9. Scales  $\frac{9}{41}$ , the transverse series twice as numerous as those of the lateral line posteriorly, and three times as numerous anteriorly. Besides the black specks there is a row of eight dusky spots on the side of the body.

GEOPHAGUS GYMNOPENYS Hense!, *Arch. für Naturgesch.*, 1870, p. 61; Von Jhring, *Süßwasser Fische von Rio Grande do Sul*, 1893, p. 31.

I find four species of *Geophagus* in the Smith collection, which differ as follows:

a. Cheeks naked or nearly so.

Profile nearly straight; eye one-third head; caudal fin emarginate; anal soft rays, 8; body oval; smaller..... *G. gymnopenys*.

Profile of skull strongly convex at orbit; eye one-third head; outline of body contracting from first dorsal spine posteriorly; caudal fin truncate; anal soft rays, 8; smaller..... *G. camurus*.

aa. Cheeks scaly.

Profile straight, preorbital bone wider; caudal fin truncate; anal with eight soft rays; eye one-fourth head; l. l., 25; smaller.. *G. brachyurus*.

Profile straight; preorbital bone much wider; eye more than four times in head; body oval; l.l., 28; anal with nine soft rays; caudal fin rounded; larger..... *G. brasiliensis*.

In each of the four species of *Geophagus* here described, the inferior bounding fold of the inferior lip is interrupted at the middle line. The

lamelliform lobe of the first branchial arch is simple in the *G. gymnogenys*, in *G. camurus* and *G. brachyurus* its border is divided into digitate processes. In my specimen of *G. brasiliensis* the digitate processes are present but rudimental. Hensel has distinguished a species as characterized among other points by the absence of scales on the cheek. Steindachner does not appear to have met with this condition in the *G. brasiliensis*, yet he refers Hensel's species to the latter, believing that the absence of scales from the cheek is an abnormality, "probably most frequent during the spawning season." I find the character on the contrary to be constant in the eight specimens of *G. gymnogenys* and *G. camurus*, which are of different sizes and ages, and which are characterized by well-marked peculiarities of the form of the head and the body. The scales are constantly present in five specimens of the *G. brachyurus*, which are of the same size as those of the *G. gymnogenys* and *G. camurus*, and are associated with equally well-marked specific characters. I believe with Von Jhring that Hensel is right in regarding the character as of specific value.

In the *Geophagus gymnogenys* the anterior border of the orbit is as far from end of muzzle as the posterior border of the orbit is from the convexity of the opercular border. Profile nearly straight, dorsal fin not scaly at base. Cheek naked except a patch of five scales between the orbit and preopercle. Preorbital bone a little wider than tegumentary orbit. Scales  $\frac{3}{28}$ . Fin radii, D. XIII. 11; A. III. 8. Body deep; the depth contained in the length to base of caudal fin 2.33 times; length of head in the same, three times. Pectoral fin reaching first soft ray of anal; caudal fin openly emarginate.

Color brown, each scale with a paler centre. A dark-brown spot extends over the dorsum immediately in front of the dorsal fin and extends to the lateral line on each side. Two dark spots below the spinous dorsal fin, and two below the soft dorsal, above the lateral line. A dark spot below the lateral line behind the superior opercular angle, and another on the side below the rays xi and xii of the spinous dorsal. Dorsal and caudal fins dusky with rather numerous oval and round pale spots. A dark spot on superior part of operculum and one below eye.

Total length, 107 mm.; length to base of caudal fin, 87 mm.; length to base of anal, 53 mm.; length to base of ventral, 39 mm.; length of head side, 26 mm.

One specimen.

#### GEOPHAGUS CAMURUS sp. nov.

Anterior border of orbit more distant from end of muzzle than the posterior border is from convex border of operculum. Profile strongly convex at and in front of the orbit. Form most elevated at the base of the dorsal fin, then tapering posteriorly. Cheeks naked or with one or two obscure scales. Preorbital bone a little wider than tegumentary orbit.

Scales  $\frac{3\frac{1}{2}}{28}$ . Fin radii, D. XIV. 10; A. III. 8; two out of seven specimens with the dorsal spines XIII, and two with the soft rays of the anal 9. Caudal fin truncate. Greatest depth entering length, minus caudal fin, 2.5 times; length of head in same three times. Diameter of eye entering head three times. Pectoral fin reaching first soft ray of anal.

Color brown, each scale with a paler centre. The spotting is similar to that of the *G. gymnogenys* except that the dorsal region is dusky and without well defined spots, the saddle shaped black spot in front of the dorsal only remaining. Below the lateral line on the middle of the side is a strongly defined spot, and traces of one behind the epiclavicle are also visible. A dark bar below the orbit, which is absent from most of the specimens, which have been somewhat bleached by alcohol. Fins spotted as in *G. gymnogenys*.

Total length, 95 mm.; length to base of caudal fin, 72 mm.; length to base of anal, 48 mm.; length to base of ventral, 26 mm.; length of head on side, 24 mm.

Seven specimens. This species is near the *G. gymnogenys*, but differs much in the form of the head and body, and in the number of the rays of the dorsal fin.

#### GEOPHAGUS BRACHYURUS sp. nov.

Anterior border of orbit about as far from the end of the muzzle, as from the convexity of the opercular border. Preorbital bone distinctly longer than diameter of tegumentary orbit. Profile straight, slightly concave at orbit. Form of body to caudal peduncle an oblong oval.

Cheeks with five rows of scales below orbit. Scales  $\frac{3\frac{1}{2}}{25}$ . Fin radii, D. XIV. 9; A. III. 8. In two specimens the dorsal rays are XV. 9 and XIII. 10; and in the latter specimen the anal rays are III. 9; in a thin specimen the anal rays are III. 7. Caudal fin truncate. Greatest depth entering the length, minus the caudal fin, 2.2 times; length of head entering the same 2.75 times. Diameter of eye entering side of head four times.

Color in alcohol brown, the dorsal and anal fins blackish. The color of the spinous part of the former is varied by the presence of oblique spots of a pale color, which form stripes running upwards and backwards. These transparent spots are wanting on the anal fin. A black spot at base of first dorsal rays; another below the lateral line below the middle of the spinous dorsal and a black bar below the eye.

Total length, 97 mm.; length to base of caudal fin, 75 mm.; length to base of anal, 52 mm.; length to base of ventral, 35 mm.; length of head, 28 mm.

Five specimens. This species is well distinguished from the species previously described, by the smaller eye, and an abbreviation of the body

posteriorly. The latter character reduces the number of scales of the lateral line and alters the relative proportions generally. Thus the length of the caudal peduncle equals that of the preorbital bone to the orbit; in the *G. gymnogenys* it equals the length of that bone plus the diameter of the orbit. The coloration of the fins is also peculiar.

GEOPHAGUS BRASILIENSIS Quoy and Gaimard; Steindachner, *Sitzb. K. Wien Akad.*, 1871, December, p. 13.

Anterior border of orbit considerably farther from the end of the muzzle than the posterior border is from the convex edge of the operculum. The middle of the length of the head falls near the middle of the pupil. Profile straight and steeply descending. Preorbital bone 1.75 times as long as the diameter of the orbit. Cheeks with five rows of scales.

Form of body oval, a little higher in front. Scales  $\frac{4\frac{1}{2}}{28}$ . Fin radii, D.

XV. 11; A. III. 9. Greatest depth two and one-third times in length to base of caudal fin; length of head in same two and three-quarter times. Diameter of eye entering head 4.66 times, and twice in the interorbital width, measured over its strong convexity. Caudal fin rounded, truncate in the middle, its basal portion scaly throughout.

Color light brown in alcohol, each scale with a paler centre; a large black spot below the lateral line opposite the middle of the spinous dorsal fin. A few scattered pearl blue spots on the operculum and on the scales posterior to it. Caudal fin, spinous dorsal, and base of soft dorsal dusky; the caudal with oval transparent spots and the spinous dorsal with a few oblique transparent streaks, directed upwards posteriorly. A few round transparent spots at the posterior base of the soft dorsal. Paired fins unspotted, the anterior rays of the ventrals dusky.

Total length, 193 mm.; length to base of caudal fin, 153 mm.; length to base of anal, 102 mm.; length to base of ventrals, 58 mm.; length of head, 54 mm.

This species agrees with the *G. gymnogenys* and *camurus* in its scale formula, and with the *G. brachyurus* in its scaly cheek and coloration. It differs from all of them in the more posterior position of the eye and length of preorbital bone, and in the shape of the caudal fin. In some respects it agrees with the *Geophagus macrolepis* of Günther,\* but in that fish the eye has a much more posterior position. There is but one specimen of the *G. brasiliensis* in the collection.

ACARA TETRAMERA Heckel *Brasil. Fluss-Fische*; *Ann. der Wien Mus*, ii, p. 341. Steindachner *Sitzber. Wien Akad.*, 1875, January, p. 5.

Numerous specimens. Dr. Steindachner having endeavored to show that the *A. flavilabris* Cope, is identical with this species, I embrace the present opportunity of making a direct comparison. With five speci-

\* *Catal. Fishes Brit. Mus.*, iv, p. 314.

mens of the *A. flavilabris* before me, I find that there are but two rows of scales on the cheek, one row on the inferior limb of the preopercle, and one on the interopercle, as I have figured and described. In *A. tetramera* there are three rows on the cheek, and none on the preopercle and interopercle, as described by Steindachner. The preorbital bone is only .66 the diameter of the orbit in *A. flavilabris*, as in the younger *A. tetramera*. The front between the orbits is absolutely flat in *A. flavilabris*, while it is convex at the borders in *A. tetramera*. All the specimens of *A. flavilabris* have XVI dorsal spines. In all the lower lip is conspicuously yellow, a character not present in the *A. tetramera* in my collection, nor described by authors. The absence of this characteristic mark is the only fault in my figure.\*

ACARA AUTOCHTHON Gthr. Steindachner *Sitzber. K. Wien Akad.*, 1874, December, p. 4.

### SUMMARY.

The species enumerated in the preceding pages are distributed in families as follows :

	Total.	New Genera.	New Species.
Clupeidæ .....	1	0	0
Characinidæ .....	15	3	9
Sternopygidæ.....	2	0	0
Siluridæ .....	14	0	6
Symbranchidæ .....	1	0	0
Cyprinodontidæ.....	1	0	0
Cichlidæ.....	8	0	2
	<hr/>	<hr/>	<hr/>
Total.....	42	3	17

Besides the addition of seventeen species to the fauna of the Jacuhy river, five genera are introduced. Four of these are Characinidæ, viz : *Asiphonichthys*, *Chorimycterus*, *Diapoma* and *Pseudocorynopoma*. Of these the first three are new to science, and the last has been previously known from the drainage of the La Plata only. The fifth genus is *Sternopygus*, which has not been enumerated by previous authors as found in the Jacuhy river.

### NOTE.

Mr. Smith obtained near Chapada in Matto Grosso from the head waters of the Paraguay, *Tetragonopterus lineatus* Steind. and *T. moorei* Boul. From the head waters of the Tocantins, not far from the same locality, he obtained a species close to the *T. caudimaculatus* Gthr.

\* *Proceeds. Academy Phila.*, 1872, p. 255., Pl. xi, Fig. 4.



## EXPLANATION OF PLATES.

Figures all natural size unless otherwise stated.

## PLATE IV.

Fig. 1. *Xiphorhamphus brachycephalus* Cope; *a.* head from above.

## PLATE V.

Fig. 2. *Asiphonichthys stenopterus* Cope.

3. *Chorimycterus tenuis* Cope.

4. *Diapoma speculiferum* Cope.

5. *Tetragonopterus pliodus* Cope.

## PLATE VI.

Fig. 6. *Tetragonopterus jacuhiensis* Cope.

7. *Tetragonopterus luticeps* Cope.

8. *Tetragonopterus eigenmanniorum* Cope.

9. *Chirodon monodon* Cope.

## PLATE VII.

Fig. 10. *Rhamdella straminea* Cope.

11. *Hisonotus leptochilus* Cope. *a.* Head from above  $\frac{3}{2}$  natural size;  
*b.* Head from below.

12. *Hisonotus levior* Cope. *a.* Head from above  $\frac{3}{2}$  natural size;  
*b.* Head from below.

13. *Otocinclus flexilis* Cope. *a.* Head from above  $\frac{3}{2}$  natural size;  
*b.* Head from below.

## PLATE VIII.

Fig. 14. *Plecostomus aspilogaster* Cope,  $\frac{3}{4}$  natural size. *a.* head from  
below  $\times \frac{3}{4}$ .

15. *Loricariu cadeæ* Hensel, from side. *a.* From above; *b.* From  
below  $\frac{3}{2}$  natural size.

## PLATE IX.

Fig. 16. *Otocinclus fimbriatus* Cope. *a.* Head from above  $\times 2$ ; *b.*  
Head from below  $\times 2$ .

17. *Geophagus canurus* Cope.

18. *Geophagus brachyurus* Cope.